Full Annual Cycle conservation of migratory birds in the western hemisphere

Jill Deppe
National Audubon Society

Black-throated Green Warbler. Photo: Joshua Galicki, Audubon Photography Awards

Conservation Need

End users:

- National Audubon Society (Audubon Americas)
- Bird Life International

End user programs:

- Conserva Aves
- National Colombian Bird Conservation Plan
- Audubon Americas Regenerative Agriculture Strategy

Key decisions & questions:

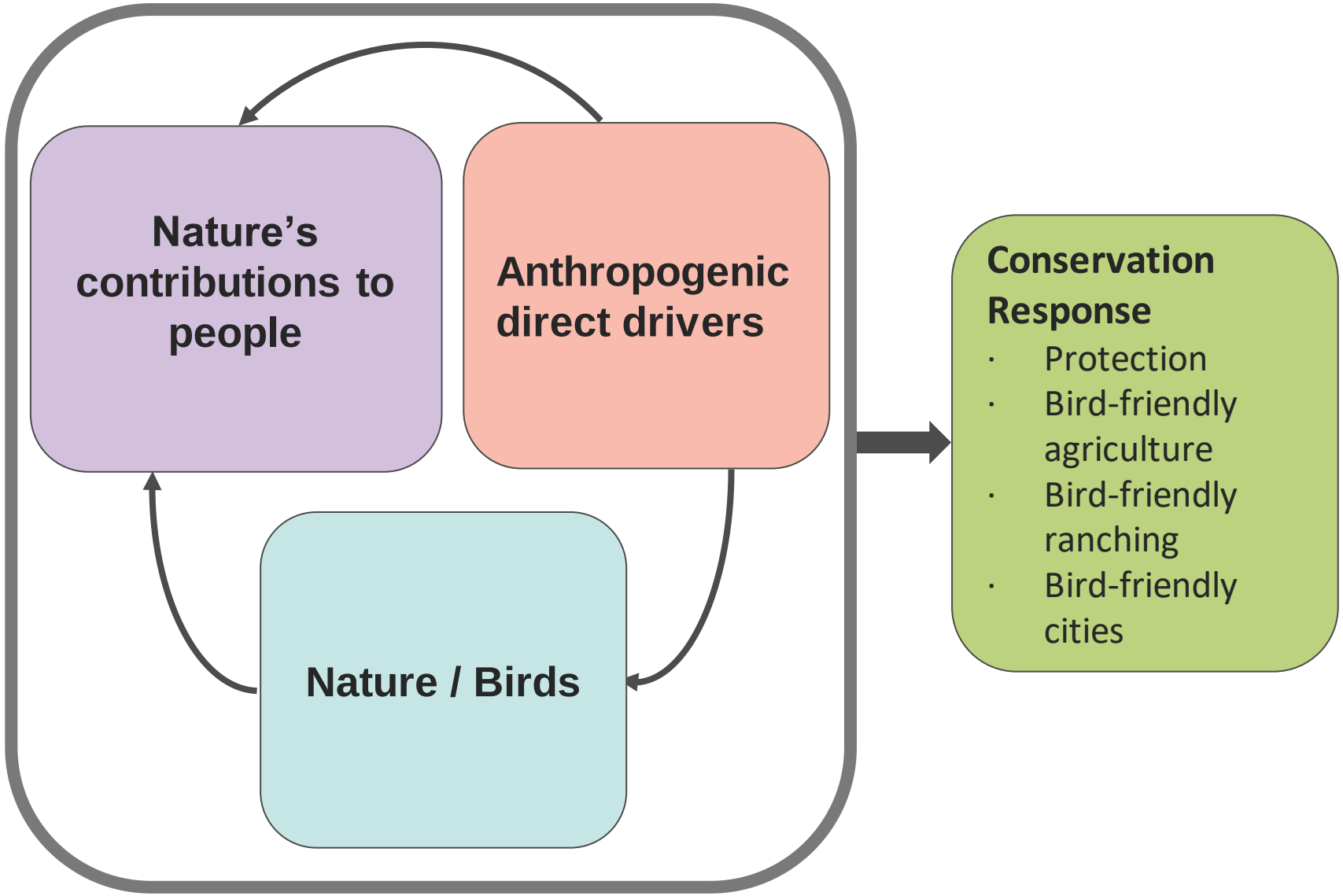
1. Where to invest in new protected areas for the conservation of North American migratory birds?
   - Evaluate new proposed subnational protected areas
   - Identify most important areas for protection
2. Where to invest in land management between and/or surrounding protected areas to improve conservation value?
   - Bird-friendly cities
   - Bird-friendly ranching
   - Bird-friendly agriculture (sugar cane, rice)

Overarching framework

Application Geography: Colombia

Goal: Create a decision-support tool that provides theory of change for how different actions impact migratory birds.

DST informs conservation responses to reduce the pressure from direct drivers, enhance nature and its contributions to people.



Decision Support Tool

Nature / Birds

- **Full annual cycle prioritizations**
  - Forest
  - Open
  - Grasslands
  - Wetlands
  - Coasts
- **Bird Friendliness Index**
  - Lowland forests
  - Montane forests
  - Submontane forests
  - Dry forest/aridlands
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Nature's contributions to people

- Carbon sequestration
- Water availability for people
- Mangroves

Anthropogenic direct drivers

- Urbanization
- Future urbanization
- Agriculture types
- Ranching/pastures
- Forest loss to fire

Geometries for spatial summaries

- Protected areas
- Conserva Aves proposed protected areas
- IBAs/KBAs
- Indigenous lands
- Departments
- Municipalities
- User provided shapes or hand drawn polygons

Supporting assets for calculations

- Connectivity among existing protected areas
- Ecosystem types (Colombia landcover + DEM)
- Canopy height (Lidar)

Responses:

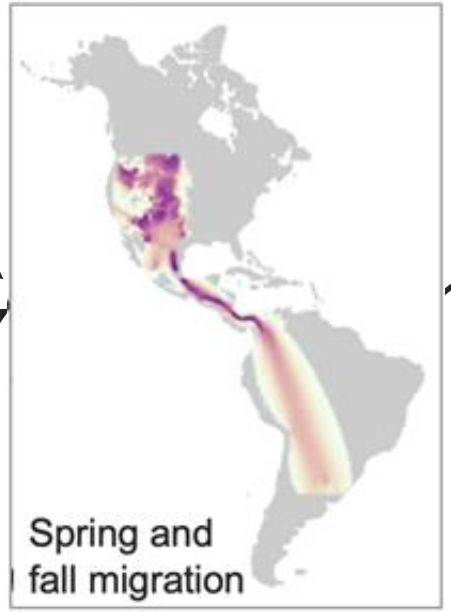
- Protection
- Bird-friendly agriculture
  Bird-friendly ranching
- Bird-friendly cities

Migratory bird full annual cycle prioritization

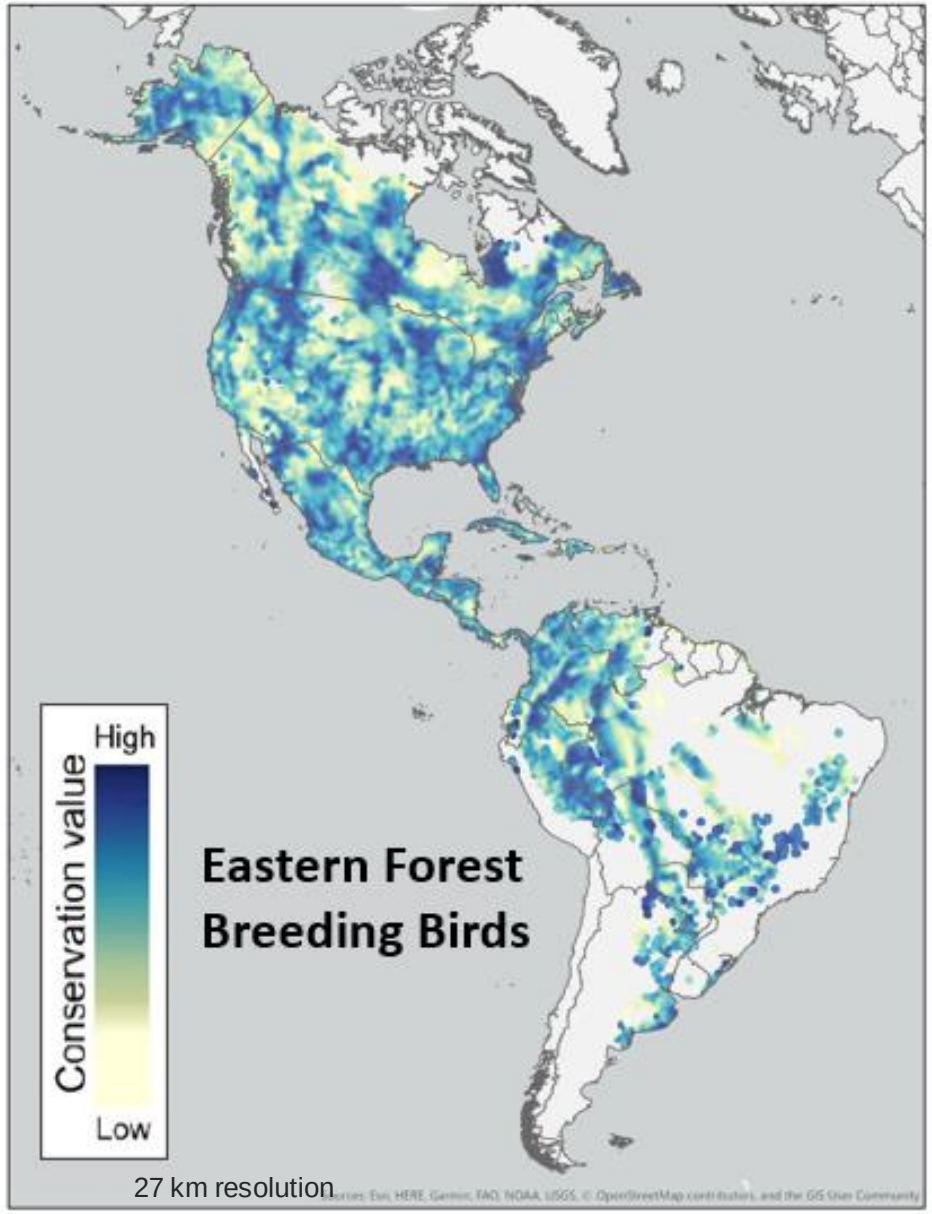
eBird Status abundance data

Tracking & banding data

Data integration process



93 species into Zonation software



Meehan et al. (2022) Ecological Applications (data integration process)

DeLuca et al. (In review) Conservation Applications (full annual cycle prioritizations)

Migratory Bird Friendliness Index

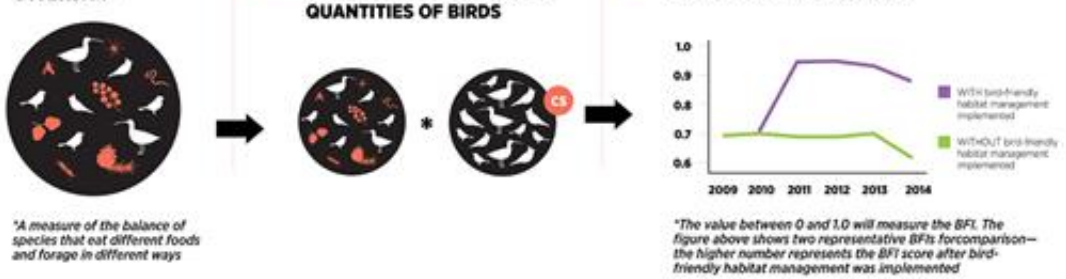
HOW DO WE MEASURE IT?

The BFI is the sum product of bird abundance, weighted by conservation status, and multiplied by functional diversity

1. COUNT BIRDS
2. ESTIMATE QUANTITY
3. MULTIPLY EACH SPECIES' QUANTITY BY ITS CONSERVATION SCORE (CS)[1]
4. ADD TOGETHER CONSERVATION-WEIGHTED QUANTITIES FOR ALL SPECIES IN A HABITAT

[1]Partners in Flight. 2020. Avian Conservation Assessment Database. Partners in Flight and Bird Conservancy of the Rockies. Available from: pif.birdconservancy.org.

5. CALCULATE FUNCTIONAL DIVERSITY*
6. MULTIPLY FUNCTIONAL DIVERSITY BY FULL CONSERVATION-WEIGHTED QUANTITIES OF BIRDS
7. RESCALE THE RESULTS SO THE FINAL VALUES GO FROM 0 TO 1, FOR EASE OF COMPARISON*

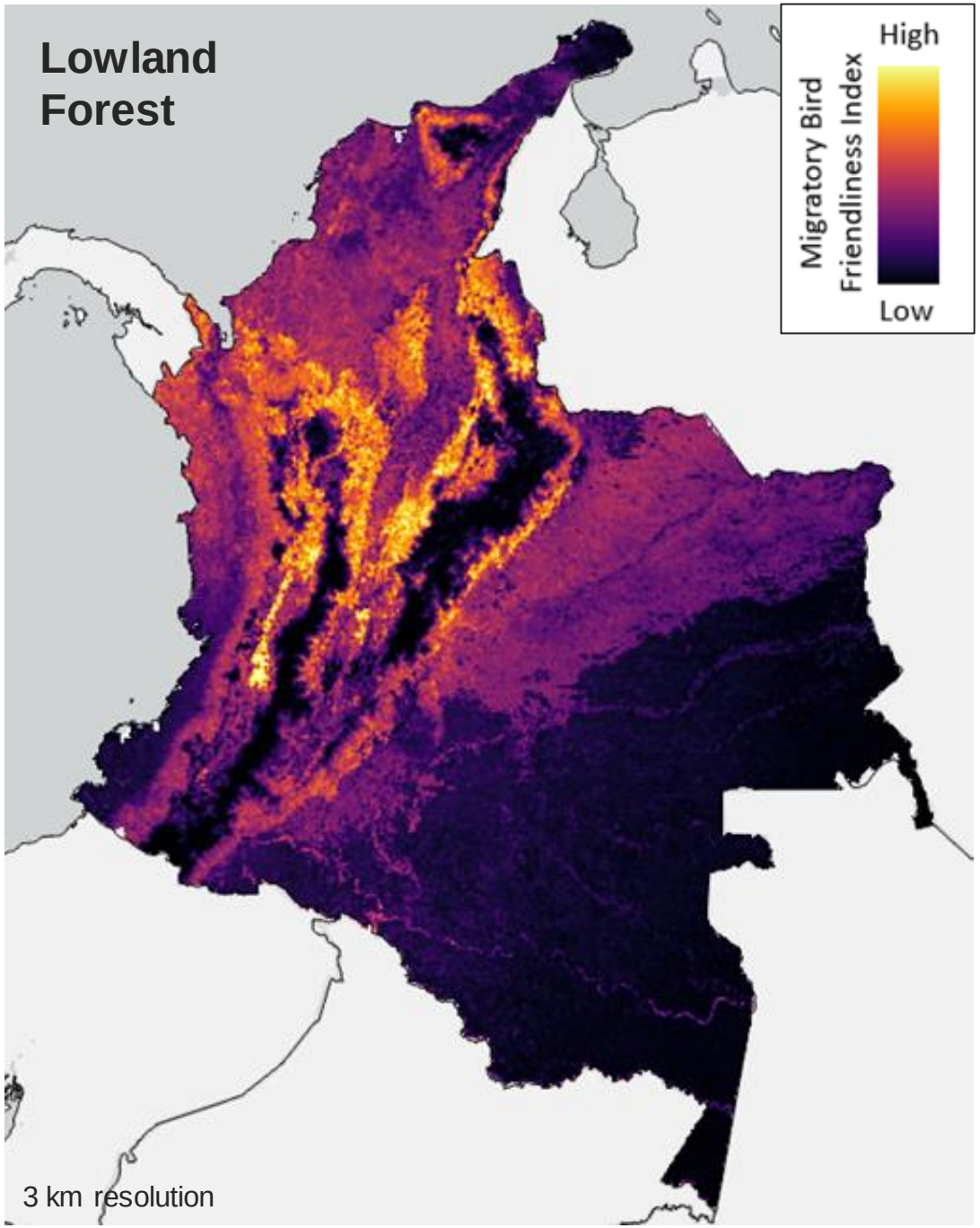


*A measure of the balance of species that eat different foods and forage in different ways

*The value between 0 and 1.0 will measure the BFI. The figure above shows two representative BFIs forcomparison—the higher number represents the BFI score after bird-friendly habitat management was implemented

WHAT DOES THE BFI TELL US?

Areas with higher abundance and more vulnerable birds support healthy communities. High functional diversity means communities are more stable and resilient.

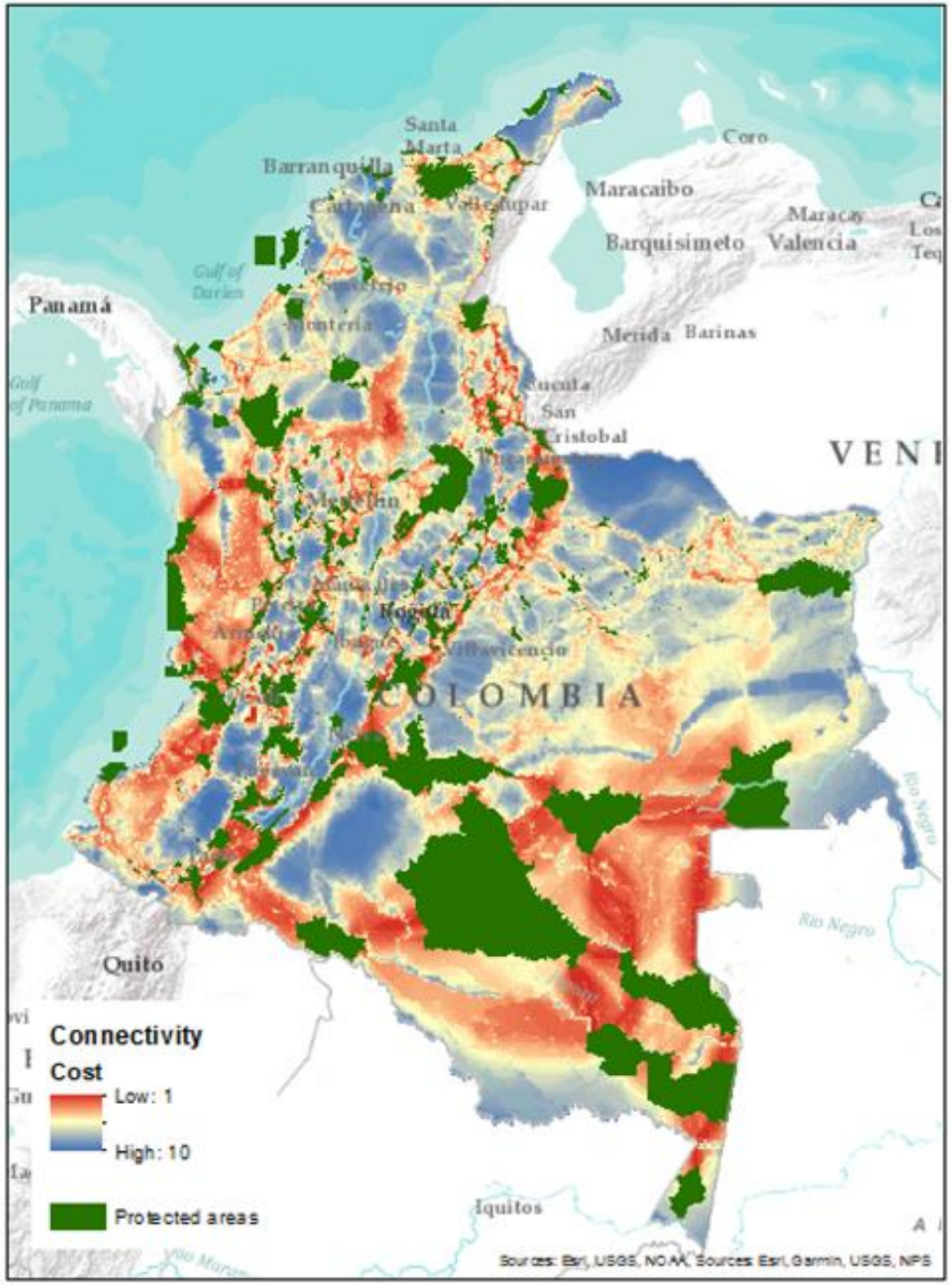


Michel et al. (2020) Diversity and Distributions

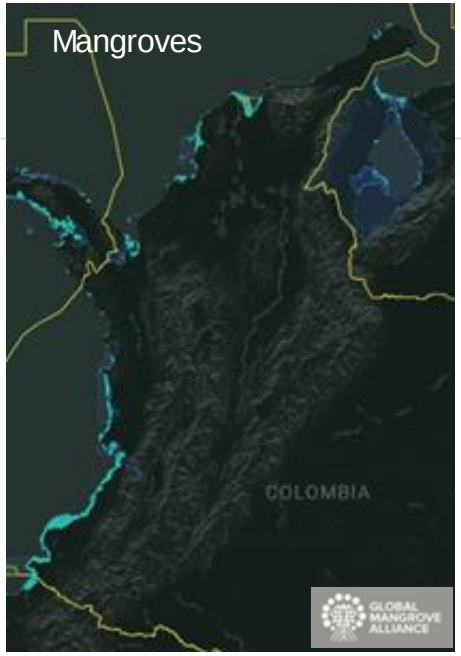
Functional Connectivity

Data source: Based on Audubon's SDMs for 26 forest dependent species, resistance data from expert consultation and the National Landcover Map from IDEAM (2018)

Information & resolution: Corridor cost for forest dependent bird species. Resolution 300m.

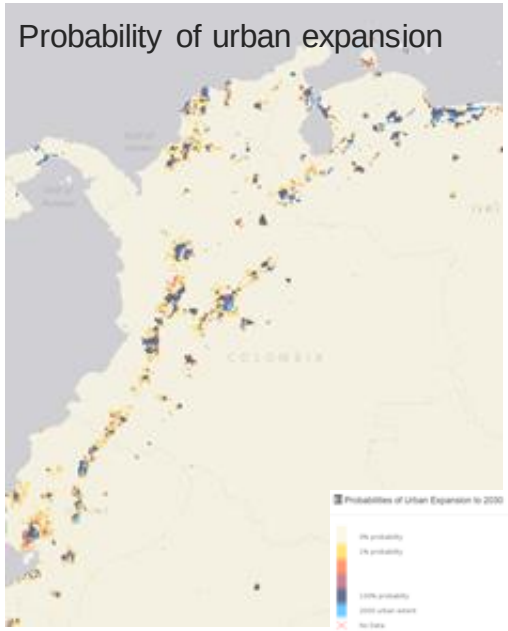


Earth observation data

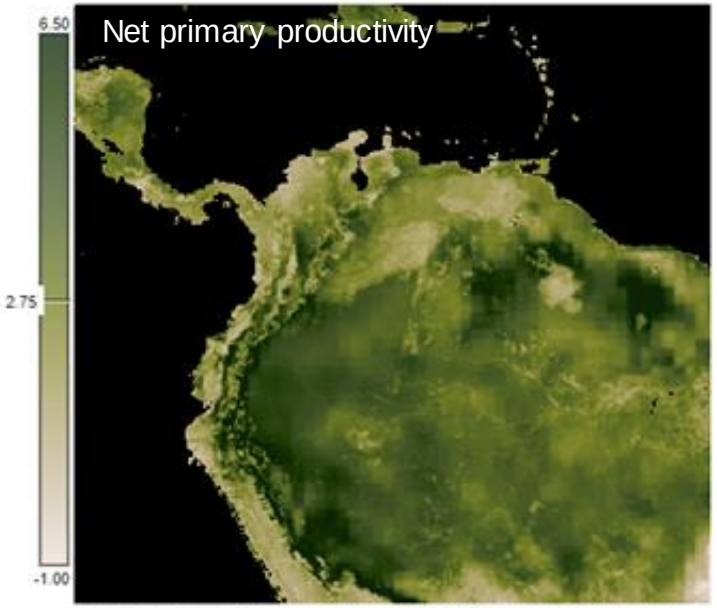


Pekel et al. 2016

GEDI ECOSYSTEM LIDAR



NASA SEDAC



Net Primary Productivity (8 day - Terra/MODIS) November 1 - 9 2016

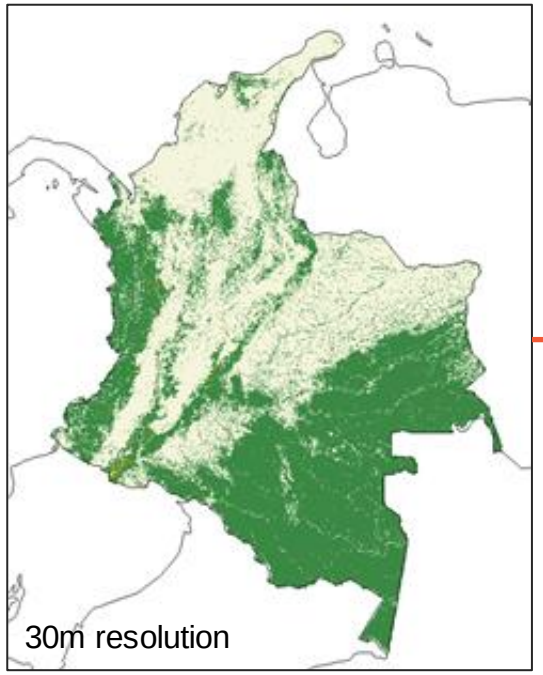
GLAD Global Land Analysis & Discovery

Ecosystem type

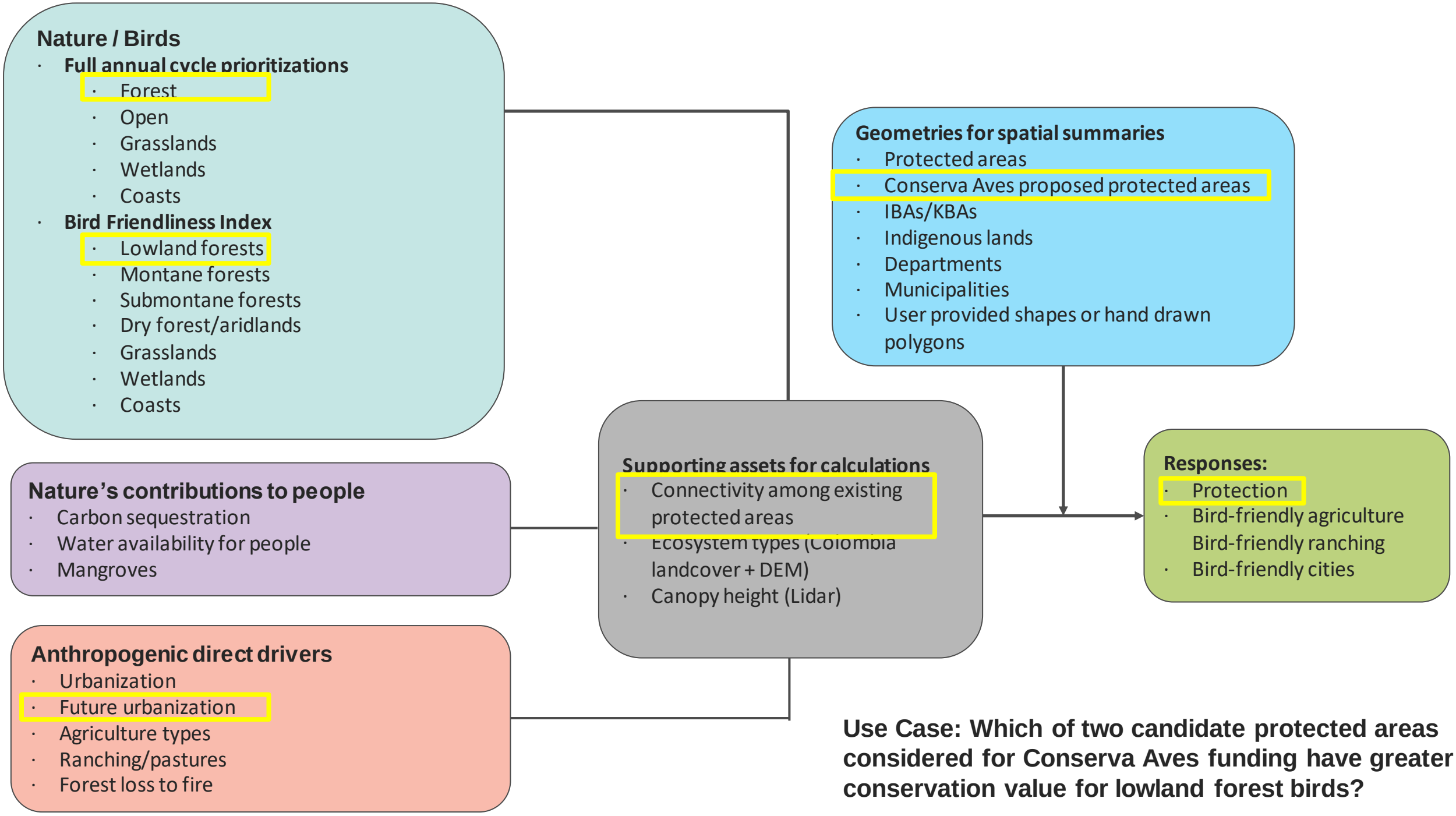
DEM (from SRTM)

Lowlands (0-500m)

Forest cover (IDEAM-Landsat)



Lowland forest ecosystem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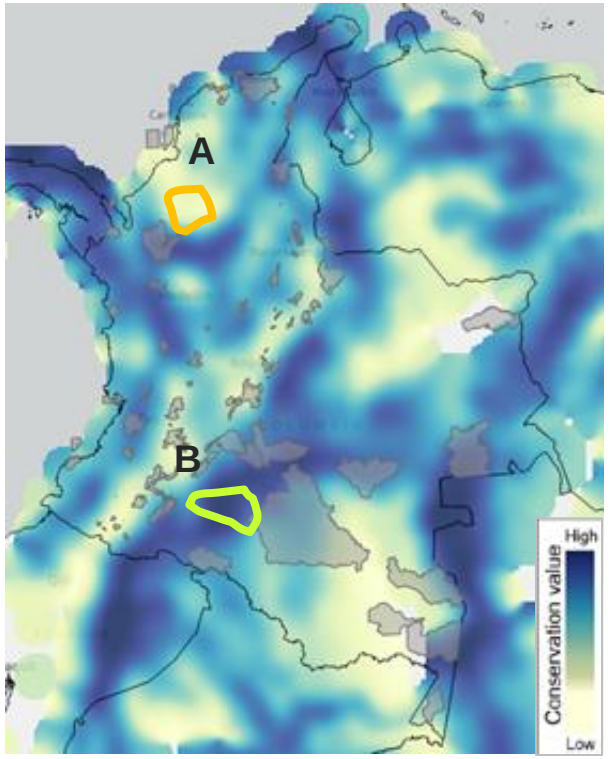
Use Case: Which of two candidate protected areas considered for Conserva Aves funding have greater conservation value for lowland forest birds?

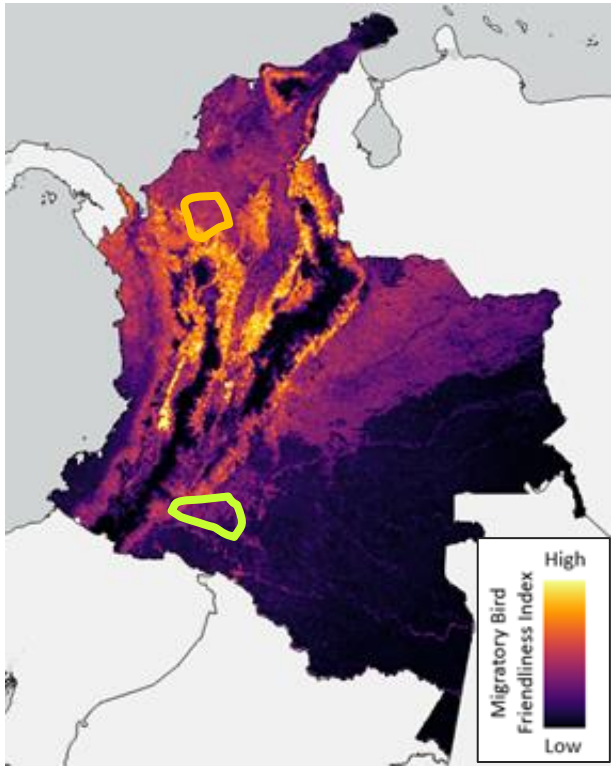
Candidate Area	FAC	BFI	Urban	Connect
A	0.1	0.5	< 0.01	0.5
B	0.8	0.3	< 0.01	0.9

Comparison of two proposed protected areas for funding

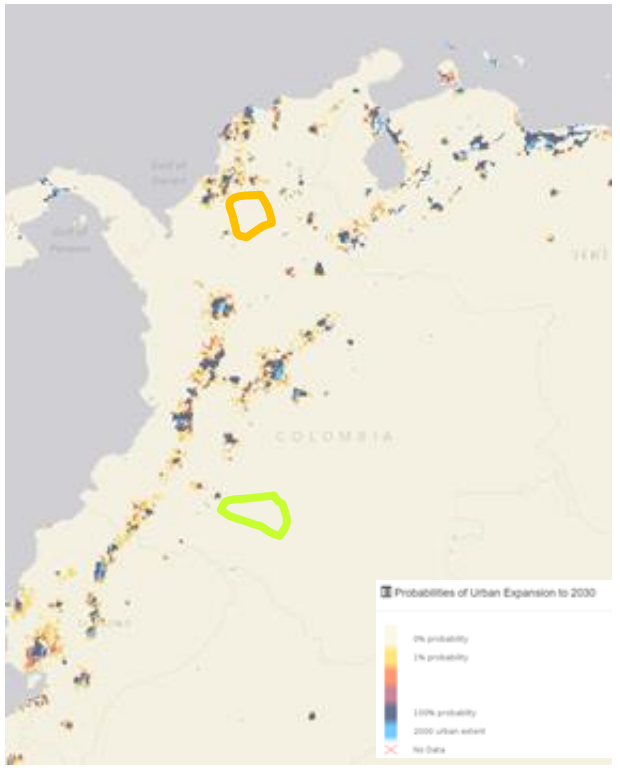
Forest Bird Full Annual Cycle



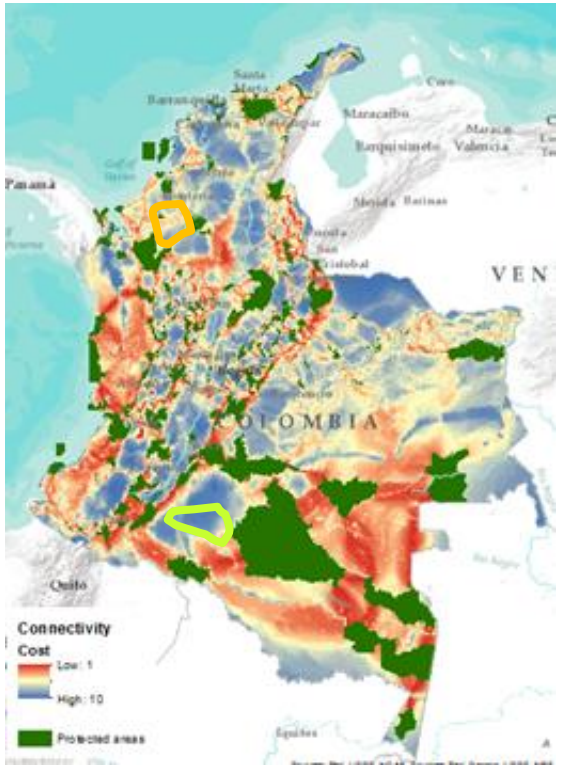
Lowland forest Bird Friendliness Index



Future urban expansion



Connectivity



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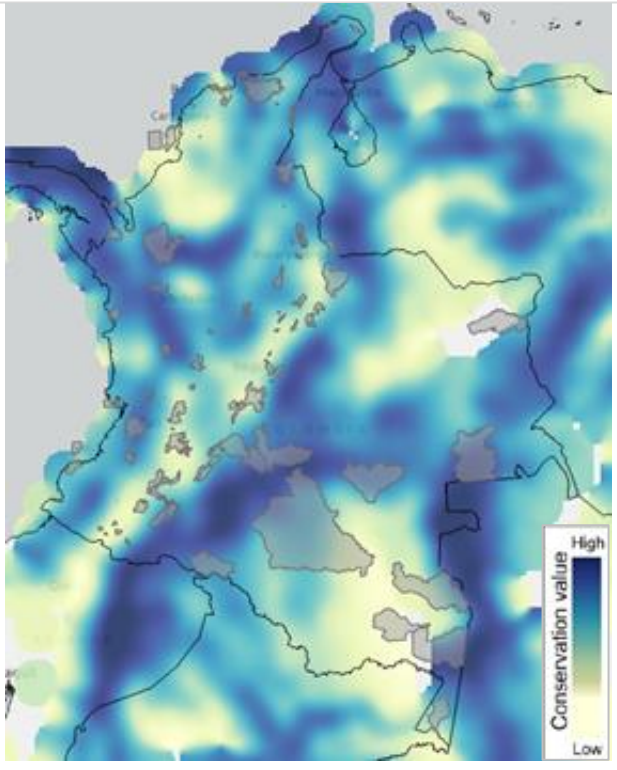
Use Case: Where are the places where sustainable grazing practices would offer greatest benefits for lowland forest migratory birds?

Mapping priority areas for bird-friendly ranching



Forest migratory birds

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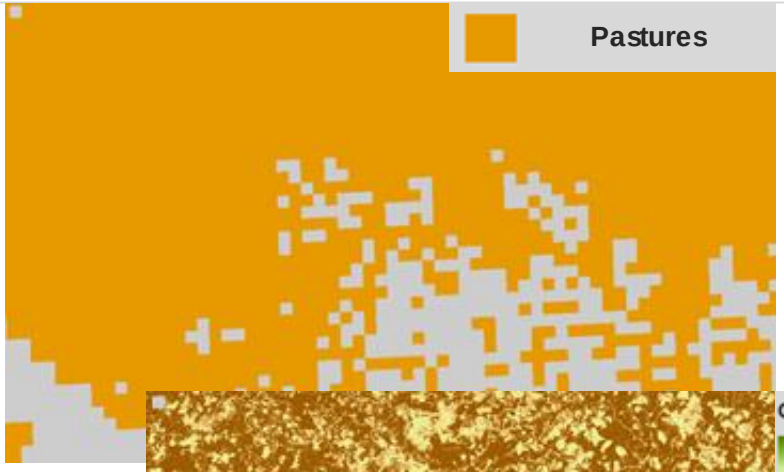

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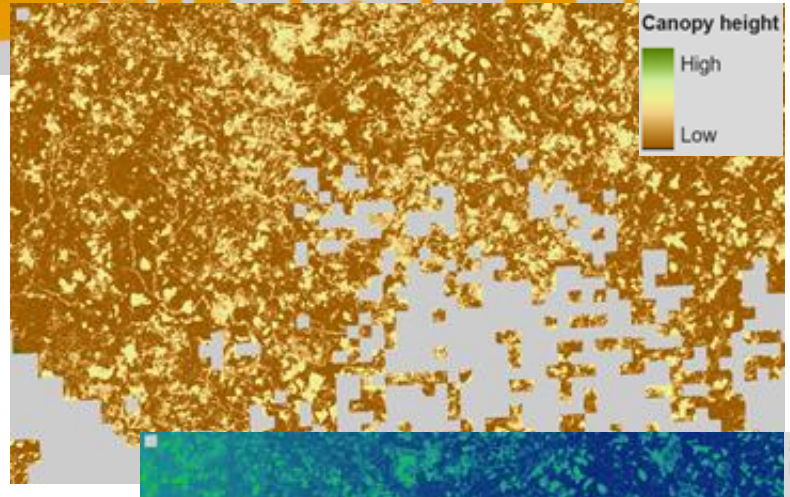

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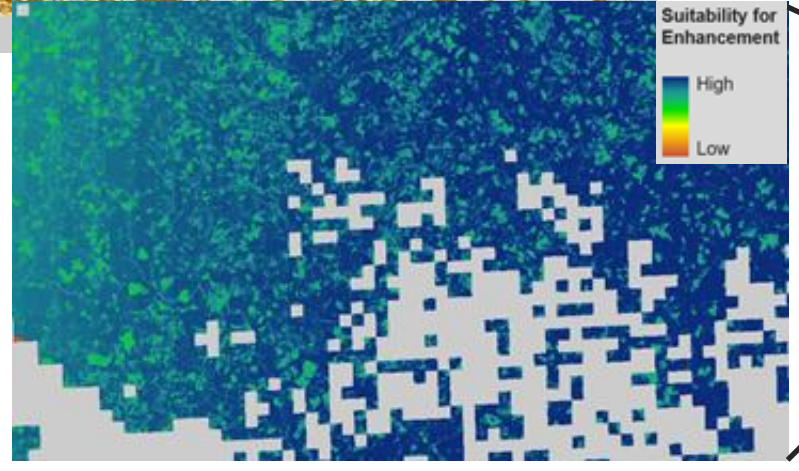
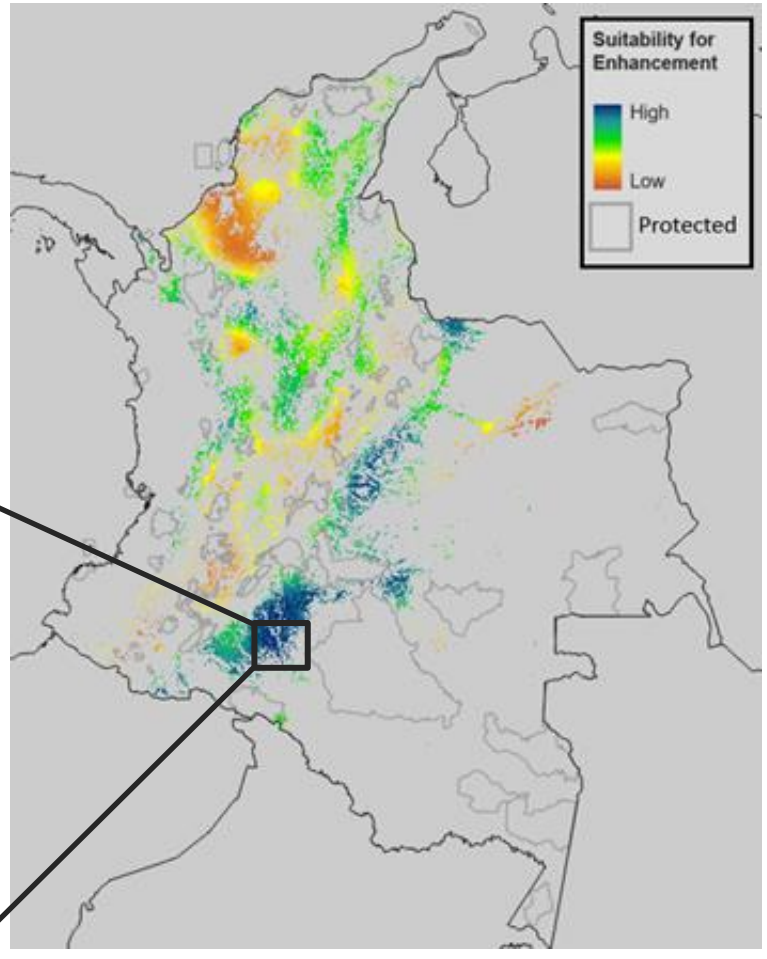


Suitability for enhancement:
Places in **pasture**, with **low canopy height**, and in **landscapes that support forest migratory birds**



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BirdLife INTERNATIONAL

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REDLAC Red de Fondos Ambientales de Latinoamérica y el Caribe

Enca Estrategia Nacional para la Conservación de las Aves

CALIDRIS Asociación para el estudio y conservación de las aves acuáticas en Colombia

USGS science for a changing world

esri

>250 tracking data holders

Barbara and Earl Doolin

MOVEBANK

Motus

TheCornellLab Data provided by eBird

KNOBLOCH FAMILY FOUNDATION

GreenInfo Network